

REMARKS

Applicants have amended claims 24-26 to correct typographical errors and/or to more precisely claim Applicants' invention. Applicants respectfully submit that the claims as written are allowable and respectfully traverse all remaining rejections and request reconsideration. For the reasons set forth below, Applicant submits the claims are allowable as written.

Herrera

Herrera is directed to a method and apparatus for processing DVD video. More specifically, Herrera discusses the modification of a 3D graphics accelerator to support MPEG-2 video decoding in a computer system for playing back a DVD data stream. (Abstract). Herrera further states that the modification of the 3D graphics accelerator allows for YUV 4:2:0 to YUV 4:2:2 conversion. (*Id.*). In support of making such a modification to the 3D graphics processor, Herrera specifically notes the similarity between the YUV 4:2:0-to-4:2:2 conversion process and certain 3D texture mapping processes typically supported by most 3D engines. (col. 10, lns. 20-27). Herrera does not disclose, teach or suggest, whether considered alone, or in view of Sid-Ahmede, Applicants' method for de-interlacing interlaced video using a graphics processor.

Sid-Ahmed

Sid-Ahmed is directed to interpixel and interframe interpolation of television pictures with conversion from interlaced to progressive scanning, (title). More specifically, Sid-Ahmed is directed to "The present invention [which] provides ... for increasing the number of pixels per horizontal line, increasing the number of horizontal lines, and doubling the number of frames per second ... The picture elements (pixels) ... are read-out at 8 times the horizontal sampling frequency and transmitted to an interpolator, preferably realized as a 3-D filter, to produce twice the number pixels along each horizontal line, twice the number of lines in each frame and double the number of frames/second," (col. 1, ln. 56 – col. 2, ln. 3). Sid-Ahmed, as such, discloses the reading a video image (i.e., both first and second interlaced fields), and with this entire video image, an interpolator is then used to then generate additional horizontal pixels, twice the number of lines per frame, and twice the number of lines in each frame, and double the number of frames per second.

As such, Sid-Ahmed is directed to a system that generates an image representing all the interlaced data (i.e., the first and second interlaced field) using all of the interlaced data (i.e., the

first and second interlaced field) as input, where the resulting image is at a higher resolution than that represented by the interlaced data, and as such, is not directed to generating an image representing all of the interlaced data (i.e., the first and second interlaced field) using only a portion of the interlaced data (i.e., the first interlaced field only) as input, where the resulting image is at the same initial resolution as the interlaced data. Further, Sid-Ahmed discloses the multiple readings of the first and second interlaced frame data to an interpolator at 8 times the horizontal sampling frequency.

§ 103(a) Rejections

Applicants respectfully submit that neither Herrera and Sid-Ahmed, whether considered alone or in combination, disclose, teach or suggest, either explicitly or implicitly, Applicants' claimed subject matter including claims 2-9, 11-15 and 17-26.

Claims 2-9, 11-15 and 17-26

Independent Claim 24

Applicants first note that claim 24 has been amended to correct typographical errors and to more precisely claim Applicants' invention. Applicants submit that neither Herrera nor Sid-Ahmed disclose, teach or suggest Applicants' claim 24 subject matter, including, inter alia:

“...receiving at least one instruction for a 2-D/3-D engine to facilitate creation of an adaptively de-interlaced frame image from at least a first interlaced field; and performing, by the 2-D/3-D engine, at least a portion of adaptive de-interlacing based on at least the first interlaced field in response to the at least one instruction to produce at least a portion of the adaptively de-interlaced frame image, wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field, wherein the first interlaced field is alternating lines of the interlaced video,”

(Claim 24). In support, Applicants acknowledge the statement in the Office Action that “Herrera does not particularly disclose the claimed 2-D/3-D engine is used for adaptively de-interlacing frame image from at least only a first interlaced field.”

Herrera

First, Applicants emphasize that not only does “Herrera .. not particularly disclose *the claimed 2-D/3-D engine is used for adaptively de-interlacing frame image from at least only a first interlaced field*,” but Herrera also does not disclose “*de-interlacing*.” “De-interlacing,” is

typically characterized where images to be displayed on interlaced display devices, such as NTSC and PAL television displays, are displayed in successive screen refreshes where a first refresh displays the odd scan lines of information, and a second refresh is used to display the even lines of information. As known in the art, each group of alternating lines of a frame, either odd or even, are each known as an "interlaced field." Further, the process of using only one interlaced field, i.e., a group of either odd or even lines, to generate the full image is known in the art as "adaptive de-interlacing."

The need to perform adaptive de-interlacing arises, for example, when there is a need to transform interlaced video information, intended to be displayed on interlaced display devices, into de-interlaced video information, intended for display on progressive display devices. Progressive display devices refresh every display line each time the screen is refreshed. Therefore, in a conversion from interlaced video to de-interlaced video, the progressive display device's need for information about each line of display image, coupled with the delayed transmission of the even and odd lines from the corresponding interlaced video information, requires that a single group of even or odd lines, an interlaced field, be used to generate the corresponding interlaced field.

It should be noted that the adaptive de-interlacing technique used to generate the missing interlaced field from the known first interlaced field generates a result, i.e., the second interlaced field, which can be displayed together with the first interlaced field as a full image on the display device. However, since such interlaced display devices can only refresh the screen in even and odd sweeps, and since the actual missing interlaced field information will arrive before the next sweep will occur, there is generally no need to generate a second interlaced field via de-interlacing as the actual second interlaced field will arrive when needed.

Unlike the transformation of interlaced video information into a full de-interlaced video image, transformation of digital signals between YUV 4:2:0 to YUV 4:2:2 (together YUV information) does not involve the use of interlaced fields. Each group of YUV information contains display information corresponding to each display line of a progressive display device. The conversion simply transforms what represents full image information for one display format into another full image information for a second display format. Here, the transformation of a first set of video information of an originating format into a second set of video information of a

second format, is unlike de-interlacing, for at least the reason that the second set of video information generated is incapable of being displayed in the originating format.

Therefore, any reference that describes the transformation between different types of YUV information, does not disclose, teach or suggest Applicants adaptive de-interlacing techniques. Therefore, any reference that describes such transformation of YUV information within a 2-D/3-D engine, also does not disclose, teach or suggest Applicants claimed subject matter.

Applicants therefore submit that neither Herrera's discussion of "a 3D graphics engine within modified graphics accelerator 84 performs the motion compensation, YUV 4:2:0-to-4:2:2 conversion ...," (col. 10, lns. 44-49), nor its discussion of "a planar YUV 4:2:0 to interleaved 4:2:2 conversion," (col. 2, lns. 54-59), discloses, teaches or suggests Applicants' claimed subject matter.

Sid-Ahmed

In addition, Applicants submit that Sid-Ahmed is wholly different that Applicants' claimed subject matter and, in fact, teaches away from Applicants' claimed subject matter. For example, Sid-Ahmed discloses that the "picture elements (pixels) saved in the frame ... are read-out at 8 times the horizontal sampling frequency ... to produce twice the number pixels along each horizontal line, twice the number of lines in each frame and double the number of frames/second," (col. 1, ln. 65 – col. 2, ln. 3). As such, Sid-Ahmed discloses the reading of both a first and second interlaced field (i.e., both together representing all the lines in any one frame), not only once, but multiple times.

This is wholly different, and further, teaches away from Applicants' claimed subject matter that includes the "creation of an adaptively de-interlaced frame image ... at least a portion of adaptive de-interlacing based on at least the first interlaced field ... wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field" (claim 24). As such, Sid-Ahmed's discloses use of all the data representing a frame image, not once, but multiple times, to generate the frame image over a wider pixel area, and as such is wholly unlike Applicants' use of "at least the first interlaced field ... [but] not [the] second interlaced field to generate" a frame image.

Because the system described by Sid-Ahmed is capable of using all of the image data, i.e., both a first and second interlaced field, there is no need for Sid-Ahmed to use less than all of the image data to generate an image, nor is there any perceivable advantage for one to modify Sid-Ahmed to use less than all of the image data in its operation. Further, to the extent that Sid-Ahmed describes a system that uses source image data to generate more detailed final image, any reduction in the detail of the source image data provided to such a system results in a less desirable detailed final image, (i.e., such system simply increases the size of what it receives, so a partial small image will become a partial large image), and one would therefore not be motivated to modify Sid-Ahmed in such a manner. In sum, one skilled in the art would not be motivated to modify the system of Sid-Ahmed to use less than both a first and second interlaced field because to do so would at least produce a less desirable de-interlaced frame image.

In addition, the full image recreation of Sid-Ahmed is also wholly different that Applicants' claimed subject matter as Sid-Ahmed is directed to transforming a set of data representing the images full detail at a given resolution to a set of data representing another corresponding image at a higher resolution, while Applicants' claimed subject matter is directed to "creation of an adaptively de-interlaced frame image ... based on at least the first interlaced field ... [and] not based on a second interlaced field, wherein the first interlaced field is alternating lines of the interlaced video," (claim 24). In other words, the system of Sid-Ahmed does not need to generate a missing part of an image 1, but simply has to attempt to generate a corresponding image 2, having a higher resolution, based on image 1, having of a lower resolution, while in contrast, Applicants' claimed subject matter performs the function of transforming data representing only part (known part) of an image 1 at a given resolution, into data representing the full image 1, at the same given resolution, by generating the missing part of the image 1, (of the same given resolution), using the data of the known part of the image 1, resulting in the original image 1.

To further emphasize the difference between that disclosed in Sid-Ahmed and that of Applicants' claimed subject matter, Applicants submit the following examples. Applicants submit that if Sid-Ahmed were to receive as input only a "first interlaced field" (i.e., absent a "second interlaced field"), or a partial image, that Sid-Ahmed could only produce such partial image at a higher resolution, and would not, generate the missing portion of the partial image. In

contrast, if the claimed subject matter of Applicants had available to it the full image data (i.e., both the first and second interlaced fields) as its input, Applicants' claimed subject matter would be unnecessary as the final image data is provided at the outset and there is no need to generate data representing the entire image. As such, Applicants again submit that one of ordinary skill in the art who was in possession of all of the cited art, including Sid-Ahmed, would not be in possession of Applicants' claimed subject matter.

In sum, Applicants submit that Herrera is does not disclose, at least, the operation of de-interlacing. Further, Herrera is does not disclose the operation of using a 2-D/3-D engine for adaptively de-interlacing frame image from at least only a first interlaced field. In addition, Applicants submit that Herrera does not disclose adaptively de-interlaced frame image from at least a first interlaced field ... wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field. Further, Applicants submit that Sid-Ahmed at least does not disclose, at least, adaptively de-interlaced frame image from at least a first interlaced field ... wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field.

Applicants note that in order for prior art references to be combined by obviousness, at a minimum, there must be a suggestion of desirability for the modification. Applicants submit that neither Herrera nor Sid-Ahmad disclose, suggest a desirability for modification, explicit or otherwise. In addition, there must be a teaching or suggestion to make the combination and a reasonable expectation of success must be both found in the prior art, and not based on Applicants' disclosure. Further, the level of skill in the art cannot be relied upon to provide the suggestion to combine references. Additionally, since neither of the cited references disclose, teach or suggest, either alone or in combination, at least, generating an adaptively de-interlaced frame image from at least a first interlaced field ... wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field, the combination of any of the cited references cannot produce the Applicants' invention as claimed.

Independent Claim 25

Applicants first note that Applicants have amended claim 25 to more precisely claim Applicants' invention. Applicants submit that neither Herrera nor Sid-Ahmed disclose, teach or suggest Applicants' claim 25 subject matter, including, inter alia:

“...determining whether at least one received instruction is for a 2D/3D engine or for a display engine, receiving the at least one instruction for the 2-D/3-D engine to facilitate creation of an adaptively de-interlaced frame image from at least a first interlaced field, performing, by the 2-D/3-D engine, at least a portion of adaptive de-interlacing based on at least the first interlaced field in response to the at least one instruction to produce at least a portion of the adaptively de-interlaced frame image, wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field; and retrieving, by a graphics processor display engine, the stored adaptively de-interlaced frame image, generated by the 2D/3D engine, for display on at least one display device, wherein the first interlaced field is alternating lines of the interlaced video”

(Claim 25). In support, Applicants direct the Examiner's attention to the arguments above directed to claim 24. Applicants respectfully submit that claim 25 is allowable for at least the same or similar reasons cited regarding the allowability of claim 24.

Independent Claim 26

Applicants first note that Applicants have amended claim 26 to more precisely claim Applicants' invention. Applicants submit that neither Herrera nor Sid-Ahmed disclose, teach or suggest Applicants' claim 26 subject matter, including, inter alia:

“...receive at least one instruction to facilitate creation of an adaptively de-interlaced frame image from at least a first interlaced field, and perform at least a portion of adaptive de-interlacing based on at least the first interlaced field in response to the at least one instruction to produce at least a portion of the adaptively de-interlaced frame image, wherein the at least a portion of adaptive de-interlacing is not based on a second interlaced field, wherein the first interlaced field is alternating lines of the interlaced video”

(Claim 26). In support, Applicants direct the Examiner's attention to the arguments above directed to claim 24. Applicants respectfully submit that claim 26 is allowable for at least the same or similar reasons cited regarding the allowability of claim 24.

Dependent Claim 2

Applicants respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 2 depends from claim 24, and as a dependent claim therefrom, claim 2 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 2 is also allowable in light of the presence of novel and non-obvious elements contained in claim 2 that are not otherwise present in claim 24.

Dependent Claim 3

Applicants respectfully reassert the arguments made above regarding claims 24 and 2. Further, Applicants submit that because claim 3 depends from claim 2, and as a dependent claim therefrom, claim 3 is allowable for at least the reasons claim 2 is allowable. Applicants further submit, argued in part at least immediate above, that claim 3 is also allowable in light of the presence of novel and non-obvious elements contained in claim 3 that are not otherwise present in claim 2.

Dependent Claim 4

Applicants submit that neither Herrera nor Sid-Ahmed disclose, teach or suggest Applicants' claim 4 subject matter, including, inter alia:

"The method of claim 24 wherein the step of performing adaptive de-interlacing by the 2-D/3-D engine includes executing 2D/3D instructions that result in performing median filtering,"

(Claim 4). In support, Applicants acknowledge the statement in the Office Action stating that "the combination of Herrera and Sid-Ahmed [does not disclose the limitation] wherein the step of performing adaptive de-interlacing by the 2-D/3-D engine includes executing 2D/3D instructions that result in performing median filtering."

Applicants note that the Office Action states that "median filtering of the video signal to improve the quality of the video signal is old and well known in the art and therefore Official Notice is taken," and then continues to state that "it would be obvious to one of ordinary skill in the art at the time the invention to incorporate the well known median filter into Herrera's system in order to increase the quality of the video signal to be displayed." In response, to the extent that this rejection is maintained in any subsequent Office Action, Applicants traverse this assertion and request a reference be provided to support the Office

Action's position. Further, the level of skill in the art cannot be relied upon to provide the suggestion to combine the references. Simply because the references can be combined is not enough for a prima facie case of obviousness. As such, Applicants submit that claim 4 is allowable as written.

Further, Applicants also respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 4 depends from claim 24, and as a dependent claim therefrom, claim 4 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 4 is also allowable in light of the presence of novel and non-obvious elements contained in claim 4 that are not otherwise present in claim 24.

Dependent Claim 5

Applicants submit that neither Herrera nor Sid-Ahmed disclose, teach or suggest Applicants' claim 4 subject matter, including, inter alia:

"The method of claim 24 wherein the step of performing adaptive de-interlacing by the 2-D/3-D engine includes executing 2D/3D instructions that result in performing spatio-temporal filtering,"

(Claim 5). In support, Applicants acknowledge the statement in the Office Action stating that "the combination of Herrera and Sid-Ahmed [does not disclose the limitation] ... wherein the step of performing adaptive de-interlacing by the 2-D/3-D engine includes executing 2D/3D instructions that result in performing spatio-temporal filtering."

Applicants note that the Office Action states that "spatio-temporal filtering the video signal to improve the quality of the video signal is old and well known in the art and therefore Official Notice is taken again," and then continues to state that "it would be have been obvious to one of ordinary skill in the art at the time the invention to incorporate the well known median spatio-temporal filter into Herrera's system in order to increase the quality of the video signal to be displayed." In response, to the extent that this rejection is maintained in any subsequent Office Action, Applicants also traverse this assertion and request a reference be provided to support the Office Action's position. Applicants note again that the level of skill in the art cannot be relied upon to provide the suggestion to combine the references. Simply because the references can be combined is not enough for a prima facie case of obviousness. As such, Applicants submit that claim 5 is allowable as written.

Further, Applicants also respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 5 depends from claim 24, and as a dependent claim therefrom, claim 5 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 5 is also allowable in light of the presence of novel and non-obvious elements contained in claim 5 that are not otherwise present in claim 24.

Dependent Claim 6

Applicants respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 6 depends from claim 24, and as a dependent claim therefrom, claim 6 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 6 is also allowable in light of the presence of novel and non-obvious elements contained in claim 6 that are not otherwise present in claim 24.

Dependent Claim 7

Applicants respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 7 depends from claim 24, and as a dependent claim therefrom, claim 7 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 7 is also allowable in light of the presence of novel and non-obvious elements contained in claim 7 that are not otherwise present in claim 24.

Dependent Claim 8

Applicants respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 8 depends from claim 24, and as a dependent claim therefrom, claim 8 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 8 is also allowable in light of the presence of novel and non-obvious elements contained in claim 8 that are not otherwise present in claim 24.

Dependent Claim 9

Applicants respectfully reassert the arguments made above regarding claim 24. Further, Applicants submit that because claim 9 depends from claim 24, and as a dependent claim therefrom, claim 9 is allowable for at least the reasons claim 24 is allowable. Applicants further submit that claim 9 is also allowable in light of the presence of novel and non-obvious elements contained in claim 9 that are not otherwise present in claim 24.

Dependent Claim 11

Applicants respectfully reassert the arguments made above regarding claim 25. Further, Applicants submit that because claim 11 depends from claim 25, and as a dependent claim therefrom, claim 11 is allowable for at least the reasons claim 25 is allowable. Applicants further submit that claim 11 is also allowable in light of the presence of novel and non-obvious elements contained in claim 11 that are not otherwise present in claim 25.

Dependent Claim 12

Applicants respectfully reassert the arguments made above regarding claim 25 and claim 5. Further, Applicants submit that because claim 12 depends from claim 25, and as a dependent claim therefrom, claim 12 is allowable for at least the reasons claim 25 is allowable. Applicants further submit that claim 12 is also allowable in light of the presence of novel and non-obvious elements contained in claim 12 that are not otherwise present in claim 25.

Dependent Claim 13

Applicants respectfully reassert the arguments made above regarding claim 25. Further, Applicants submit that because claim 12 depends from claim 25, and as a dependent claim therefrom, claim 12 is allowable for at least the reasons claim 25 is allowable. Applicants further submit that claim 12 is also allowable in light of the presence of novel and non-obvious elements contained in claim 12 that are not otherwise present in claim 25.

Dependent Claim 14

Applicants respectfully reassert the arguments made above regarding claim 25 and claim 7. Further, Applicants submit that because claim 14 depends from claim 13, and as a dependent claim therefrom, claim 14 is allowable for at least the reasons claim 13 is allowable. Applicants further submit that claim 14 is also allowable in light of the presence of novel and non-obvious elements contained in claim 14 that are not otherwise present in claim 13.

Dependent Claim 15

Applicants respectfully reassert the arguments made above regarding claim 25. Further, Applicants submit that because claim 15 depends from claim 25, and as a dependent claim therefrom, claim 15 is allowable for at least the reasons claim 25 is allowable. Applicants further submit that claim 15 is also allowable in light of the presence of novel and non-obvious elements contained in claim 15 that are not otherwise present in claim 25.

Dependent Claim 17

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 17 depends from claim 26, and as a dependent claim therefrom, claim 17 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 17 is also allowable in light of the presence of novel and non-obvious elements contained in claim 17 that are not otherwise present in claim 26.

Dependent Claim 18

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 18 depends from claim 26, and as a dependent claim therefrom, claim 18 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 18 is also allowable in light of the presence of novel and non-obvious elements contained in claim 18 that are not otherwise present in claim 26.

Dependent Claim 19

Applicants respectfully reassert the arguments made above regarding claim 26 and claim 4. Further, Applicants submit that because claim 19 depends from claim 26, and as a dependent claim therefrom, claim 19 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 19 is also allowable in light of the presence of novel and non-obvious elements contained in claim 19 that are not otherwise present in claim 26.

Dependent Claim 20

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 20 depends from claim 26, and as a dependent claim therefrom, claim 20 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 20 is also allowable in light of the presence of novel and non-obvious elements contained in claim 20 that are not otherwise present in claim 26.

Dependent Claim 21

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 21 depends from claim 26, and as a dependent claim therefrom, claim 21 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 21 is also allowable in light of the presence of novel and non-obvious elements contained in claim 21 that are not otherwise present in claim 26.

Dependent Claim 22

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 22 depends from claim 26, and as a dependent claim therefrom, claim 22 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 22 is also allowable in light of the presence of novel and non-obvious elements contained in claim 22 that are not otherwise present in claim 26.

Dependent Claim 23

Applicants respectfully reassert the arguments made above regarding claim 26. Further, Applicants submit that because claim 23 depends from claim 26, and as a dependent claim therefrom, claim 23 is allowable for at least the reasons claim 26 is allowable. Applicants further submit that claim 23 is also allowable in light of the presence of novel and non-obvious elements contained in claim 23 that are not otherwise present in claim 26.

CONCLUSION

For the foregoing reasons, withdrawal of the rejections and allowance of the claims is respectfully requested. If there are any questions or comments regarding this response, the Examiner is encouraged to contact the undersigned at 312-609-7500.

Respectfully submitted,

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